

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Jeffrey J. Darcy
Serial No.: 10/676,831
Confirmation No.: 3775
Filed: October 1, 2003
For: METHOD AND APPARATUS FOR DISTRIBUTING A LOGICAL
VOLUME OF STORAGE FOR SHARED ACCESS BY MULTIPLE
HOST COMPUTERS
Examiner: P. M. Bataille
Art Unit: 2186

REQUEST FOR RECONSIDERATION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

In response to the Office Action mailed April 23, 2007, Applicant respectfully requests reconsideration. To further the prosecution of this application, each of the rejections set forth in the Office Action has been carefully considered and is addressed below. The application as presented is believed to be in condition for allowance.

Examples of Embodiments of the Invention

Applicant provided a discussion of examples of some embodiments in Applicant's response of January 10, 2007. For the Examiner's the convenience this discussion is repeated below.

In networked computer systems in which one or more logical volumes stored on a storage system are shared among multiple host computers, a host computer may be located in a location that is geographically remote from the storage system (Applicant's specification, page 8, lines 26-31). For example, a host computer located in San Francisco may access a storage system located in

Boston (specification, page 8, lines 26-31). This geographic distance may cause latency through the network that may negatively impact the performance of the host computer (specification, page 9, lines 1-2). Moreover, if a number of host computers access logical volumes on the storage system, a high processing load may be placed on the storage system that can negatively impact its performance (specification, page 9, lines 1-2).

Some embodiments of the invention are directed to a novel technique for enabling multiple host computers to share access to at least one volume of storage. In one embodiment, a volume of storage may be exported by a host computer to at least one other host computer to provided shared access to the logical volume (specification, page 9, lines 16-18). In some embodiments, the volume of storage exported by the host computer may be one that is provided to the exporting host by a storage system and may be stored on a non-volatile storage medium (specification, page 9, lines 18-20). In another embodiment, the host computer that receives a logical volume can, in turn, export that logical volume to yet another host computer, such that a hierarchy can develop through which the logical volume is distributed throughout the computer system and made available for shared access by a number of host computers (specification, page 9, lines 20-25).

This technique for sharing access to logical volumes of storage differs from that of a conventional storage system because each host computer that accesses the logical volume can access an associated local copy of the logical volume rather than all host computers needing to access the logical volume from the storage system (specification, page 12, lines 8-12). This reduces the load on the storage system to enable it to achieve improved performance. Furthermore, the distribution of multiple copies of the logical volume throughout the computer system can result in local copies that can be accessed more quickly, without the latencies that may be found in conventional computer systems (specification, page 12, lines 12-16).

The foregoing summary is provided merely for the convenience of the Examiner in appreciating some embodiments described in the Applicant's specification. The summary may not apply to each of the independent claims, and the language of the independent claims may differ in material respects from the summary provided. The Examiner is requested to give careful consideration to the language of each of the independent claims and to address each on its own merits, without relying on the summary provided above. Applicant does not rely on the summary to

distinguish any of the claims of the present application over the prior art, but rather relies only upon the arguments provided below.

Rejections Under 35 U.S.C. §102

The Office Action rejects claims 1, 2, 4-6, 10-13, 18, 25-26, 30, 35-37, 42, 47-52, 54-55, 58-62, 71-77, 79-82, 84, 85, 88, 93-96, 98-100, 102, 107-111, 113, 115, 120-124, 126-129, 131, 132, 134, 139-143, 145, 146, 148, 153-158, 160, 161, 163, 168, and 169 under 35 U.S.C. §102(b) as purportedly being unpatentable over Saunders (6,957,294). Applicant respectfully traverses each of these rejections.

As discussed in Applicant's response of January 10, 2007, each independent claim includes a limitation that relates, in one way or another, to the concept of a host computer exporting at least a portion of logical volume to another host computer. For each independent claim, the limitation relating to this concept is set forth in Table 1 below. As discussed below in greater detail, Saunders neither discloses nor suggests the concept of a host computer exporting a logical volume (or a portion thereof) to another host computer. Thus, each of the independent claims is believed to patentably distinguish over Saunders. Each of the rejected dependent claims depends from one of these independent claims and is patentable for at least the same reasons as its respective independent claim.

Discussion of Saunders

Saunders relates to allocating a pool of global memory among a set of client/servers so that each client/server can use a portion of the memory to cache data from the storage volumes that are exported to it (Abstract). As shown in Figure 2, a resource manager 14 controls access by client/servers 10a, 10b, and 10c to storage devices 40a, 40b, and 40c (col. 3, lines 7-15). Each storage device may be partitioned into one or more volumes and resource manager 14 may associate each client/server with a volume (col. 3, lines 15-23). Thus, resource manager 14 exports volumes on the storage devices to the client/server.

In addition, each volume is assigned separate disk caching space (col. 3, lines 23-25). As shown in Figure 3, a computing device 12 that includes resource manager 14 and a system memory

28 is coupled to storage devices 40a, 40b, and 40c (col. 3, lines 50-63). System memory 28 includes global cache memory space, which is partitioned into individual volume disk caching spaces. Each volume on storage devices 40a, 40b, and 40c is assigned a portion of the global cache memory (col. 3, lines 26-34).

When a client/server issues a request to the resource manager for data stored in a volume, a volume disk cache driver 22 determines if the requested data is in the cache space assigned to that volume and, if it is, retrieves the data from the cache space (col. 5, lines 9-24). If the requested data is not cached in the cache space, the cache driver passes the request to the logical disk manager, which retrieves the data from the storage device on which the volume is stored and returns it to the cache driver (col. 5, lines 24-29). The cache driver then stores the data in the cache space for the volume before returning it to the requesting client/server (col. 4, lines 29-34).

Saunders Does Not Disclose Or Suggest A Host Computer Exporting A Logical Volume To Another Host Computer

Saunders fails to disclose or suggest that a host computer exports a volume of storage to another host computer. In the system of Saunders client/servers 10a, 10b, and 10c do not export logical volumes to one another.

Rather, in the system of Saunders, a storage system (i.e., resource manager 14 executing on computing device 12) exports volumes to the host computers (i.e., client/servers 10a-10c). A volume that is exported from the storage system to one of the host computers is not exported from that host computer to another host computer. That is, a volume is exported only from the storage system to a host computer. Host computers do not export volumes made available to them by the storage system to other host computers.

Because each independent claim includes a limitation (set forth in Table 1 below) that relates, in one way or another, to the concept of a host computer exporting at least a portion of logical volume to another host computer, each independent claim patentably distinguishes over Saunders.

Table 1

Claim	Limitation
Claim 1	exporting at least a portion of the volume of storage from the root host computer to the at least one child host computer so that the at least one child host computer and the root host computer share access to the volume of storage
Claim 25	exporting at least a portion of the volume of storage from the root host computer to the at least one child host computer so that the at least one child host computer and the root host computer share access to the volume of storage
Claim 47	exporting at least a first portion of the volume of storage from the root host computer to the at least one child host computer
Claim 71	exporting at least a first portion of the shared volume of storage from the first root host computer to the first group of child host computers
Claim 76	exporting at least a portion of the volume of storage from the first host computer to the at least one second host computer so that the at least one second host computer and the first host computer share access to the volume of storage
Claim 93	exporting at least a portion of the volume of storage from the first host computer to the at least one second host computer so that the at least one second host computer and the first host computer share access to the volume of storage
Claim 107	receiving at least a first portion of the volume of storage at the first host computer from the third host computer which exported the at least a first portion of the volume of storage to the first host computer so that the third host computer and the first host computer share access to the volume of storage
Claim 122	at least one controller, coupled to the at least one port, to export at least a portion of the volume of storage from the first host computer to the at least one second host computer so that the at least one second host computer and the first host computer can share access to the volume of storage

Claim 139	at least one controller, coupled to the at least one port, to export at least a portion of the volume of storage from the first host computer to the at least one second host computer so that the at least one second host computer and the first host computer can share access to the volume of storage
Claim 153	at least one controller, coupled to the at least one port, to receive at least a first portion of the volume of storage from the third host computer which exports the at least a first portion of the volume of storage to the first host computer so that the third host computer and the first host computer can share access to the volume of storage, the at least one controller further adapted to export at least a second portion of the volume of storage from the first host computer to the at least one second host computer so that the at least one second host computer, the third host computer and the first host computer can share access to the volume of storage

As should be clear from the foregoing, Saunders does not disclose or suggest the limitation of each independent claim listed in Table 1. Accordingly, it is respectfully requested that the rejections of these claims be withdrawn.

Each of the rejected dependent claims depends from one of these independent claims and is patentable for at least the same reasons as its respective independent claim. Accordingly, it is respectfully requested that the rejections of these dependent claims be withdrawn.

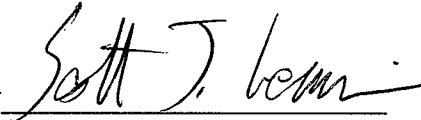
CONCLUSION

A Notice of Allowance is respectfully requested. The Examiner is requested to call the undersigned at the telephone number listed below if this communication does not place the case in condition for allowance.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Dated: July 19, 2007

Respectfully submitted,

By 

Scott J. Gerwin

Registration No.: 57,866

WOLF, GREENFIELD & SACKS, P.C.

Federal Reserve Plaza

600 Atlantic Avenue

Boston, Massachusetts 02210-2206

(617) 646-8000